US Storm Data

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Reproducible Research Week 4

Data Processing

This project involves analyzing the U.S. National Oceanic and Atmospheric Administration's (NOAA) storm database. This database tracks characteristics of major storms and weather events in the United States, including when and where they occur, as well as estimates of any fatalities, injuries, and property damage.

Set The Directory

```
setwd("C:/Users/hzarea/Desktop/Coursera/ReproducibleResearch/Week4")
```

Download and read the data and store it in stormData variable

```
#download data file
#use this one time only.  after the data is downloaded, coment it
download.file("https://d396qusza40orc.cloudfront.net/repdata%2Fdata%2FStormData.csv.bz2", destfi
le = "stormData.csv.bz2")

#read data and store in stormData
stormDatra <- read.csv(bzfile("stormData.csv.bz2"), sep=",", header=T)
```

Get the ddiminition of the stormData

```
dim(stormDatra)
```

```
## [1] 902297     37
```

Get the header of the stormData

```
head(stormDatra)
```

```
##   STATE__           BGN_DATE BGN_TIME TIME_ZONE COUNTY COUNTYNAME STATE
## 1       1  4/18/1950 0:00:00     0130       CST     97     MOBILE    AL
## 2       1  4/18/1950 0:00:00     0145       CST      3    BALDWIN    AL
## 3       1  2/20/1951 0:00:00     1600       CST     57    FAYETTE    AL
## 4       1   6/8/1951 0:00:00     0900       CST     89    MADISON    AL
## 5       1 11/15/1951 0:00:00     1500       CST     43    CULLMAN    AL
## 6       1 11/15/1951 0:00:00     2000       CST     77 LAUDERDALE    AL
##    EVTYPE BGN_RANGE BGN_AZI BGN_LOCATI END_DATE END_TIME COUNTY_END
## 1 TORNADO         0                                               0
## 2 TORNADO         0                                               0
## 3 TORNADO         0                                               0
## 4 TORNADO         0                                               0
## 5 TORNADO         0                                               0
## 6 TORNADO         0                                               0
##   COUNTYENDN END_RANGE END_AZI END_LOCATI LENGTH WIDTH F MAG FATALITIES
## 1         NA         0                      14.0   100 3   0          0
## 2         NA         0                       2.0   150 2   0          0
## 3         NA         0                       0.1   123 2   0          0
## 4         NA         0                       0.0   100 2   0          0
## 5         NA         0                       0.0   150 2   0          0
## 6         NA         0                       1.5   177 2   0          0
##   INJURIES PROPDMG PROPDMGEXP CROPDMG CROPDMGEXP WFO STATEOFFIC ZONENAMES
## 1       15    25.0          K       0
## 2        0     2.5          K       0
## 3        2    25.0          K       0
## 4        2     2.5          K       0
## 5        2     2.5          K       0
## 6        6     2.5          K       0
##   LATITUDE LONGITUDE LATITUDE_E LONGITUDE_ REMARKS REFNUM
## 1     3040      8812       3051       8806              1
## 2     3042      8755          0          0              2
## 3     3340      8742          0          0              3
## 4     3458      8626          0          0              4
## 5     3412      8642          0          0              5
## 6     3450      8748          0          0              6
```

Get only the needed stormData

```
cleanStormData <- stormDatra[,c(8,23:28)]
```

View the headers of the cleanStormData

```
head(cleanStormData)
```

```
##    EVTYPE FATALITIES INJURIES PROPDMG PROPDMGEXP CROPDMG CROPDMGEXP
## 1 TORNADO          0       15    25.0          K       0
## 2 TORNADO          0        0     2.5          K       0
## 3 TORNADO          0        2    25.0          K       0
## 4 TORNADO          0        2     2.5          K       0
## 5 TORNADO          0        2     2.5          K       0
## 6 TORNADO          0        6     2.5          K       0
```

Convert the property damage

```
cleanStormData$PROPDMGDOLLARS = 0
cleanStormData[cleanStormData$PROPDMGEXP == "H", ]$PROPDMGDOLLARS = cleanStormData[cleanStormDat
a$PROPDMGEXP == "H", ]$PROPDMG * 10^2
cleanStormData[cleanStormData$PROPDMGEXP == "K", ]$PROPDMGDOLLARS = cleanStormData[cleanStormDat
a$PROPDMGEXP == "K", ]$PROPDMG * 10^3
cleanStormData[cleanStormData$PROPDMGEXP == "M", ]$PROPDMGDOLLARS = cleanStormData[cleanStormDat
a$PROPDMGEXP == "M", ]$PROPDMG * 10^6
cleanStormData[cleanStormData$PROPDMGEXP == "B", ]$PROPDMGDOLLARS = cleanStormData[cleanStormDat
a$PROPDMGEXP == "B", ]$PROPDMG * 10^9

# Convert Crop Damage
cleanStormData$CROPDMGDOLLARS = 0
cleanStormData[cleanStormData$CROPDMGEXP == "H", ]$CROPDMGDOLLARS = cleanStormData[cleanStormDat
a$CROPDMGEXP == "H", ]$CROPDMG * 10^2
cleanStormData[cleanStormData$CROPDMGEXP == "K", ]$CROPDMGDOLLARS = cleanStormData[cleanStormDat
a$CROPDMGEXP == "K", ]$CROPDMG * 10^3
cleanStormData[cleanStormData$CROPDMGEXP == "M", ]$CROPDMGDOLLARS = cleanStormData[cleanStormDat
a$CROPDMGEXP == "M", ]$CROPDMG * 10^6
cleanStormData[cleanStormData$CROPDMGEXP == "B", ]$CROPDMGDOLLARS = cleanStormData[cleanStormDat
a$CROPDMGEXP == "B", ]$CROPDMG * 10^9
```

View the headers again to check the changes/addtions to the data

```
head(cleanStormData)
```

```
##    EVTYPE FATALITIES INJURIES PROPDMG PROPDMGEXP CROPDMG CROPDMGEXP
## 1 TORNADO          0       15    25.0          K       0
## 2 TORNADO          0        0     2.5          K       0
## 3 TORNADO          0        2    25.0          K       0
## 4 TORNADO          0        2     2.5          K       0
## 5 TORNADO          0        2     2.5          K       0
## 6 TORNADO          0        6     2.5          K       0
##   PROPDMGDOLLARS CROPDMGDOLLARS
## 1          25000              0
## 2           2500              0
## 3          25000              0
## 4           2500              0
## 5           2500              0
## 6           2500              0
```

Load the libraries need to produce the grafics

```
#Load libraries
library(ggplot2)
library(gridExtra)
```

Group fatality data by event type and sum the result

```
fatalities <- aggregate(FATALITIES ~ EVTYPE, data=cleanStormData, sum)
```

Group the injury data by event type and sum teh result

```
injuries <- aggregate(INJURIES ~ EVTYPE, data = cleanStormData, sum)
```

Sort the fatality data

```
#sort the fatality data
fatalities <- fatalities[order(-fatalities$FATALITIES), ][1:20, ]

#group by event Type
fatalities$EVTYPE <- factor(fatalities$EVTYPE, levels = fatalities$EVTYPE)
#get header
head(fatalities)
```

```
##             EVTYPE FATALITIES
## 834        TORNADO       5633
## 130 EXCESSIVE HEAT       1903
## 153    FLASH FLOOD        978
## 275           HEAT        937
## 464      LIGHTNING        816
## 856      TSTM WIND        504
```

Sort the injury data

```
#Sort the injury data
injuries <- injuries[order(-injuries$INJURIES), ][1:20, ]

#group the injury data
injuries$EVTYPE <- factor(injuries$EVTYPE, levels = injuries$EVTYPE)

#get header
head(injuries)
```

```
##             EVTYPE INJURIES
## 834        TORNADO    91346
## 856      TSTM WIND     6957
## 170          FLOOD     6789
## 130 EXCESSIVE HEAT     6525
## 464      LIGHTNING     5230
## 275           HEAT     2100
```

Set the fatality plot proamters

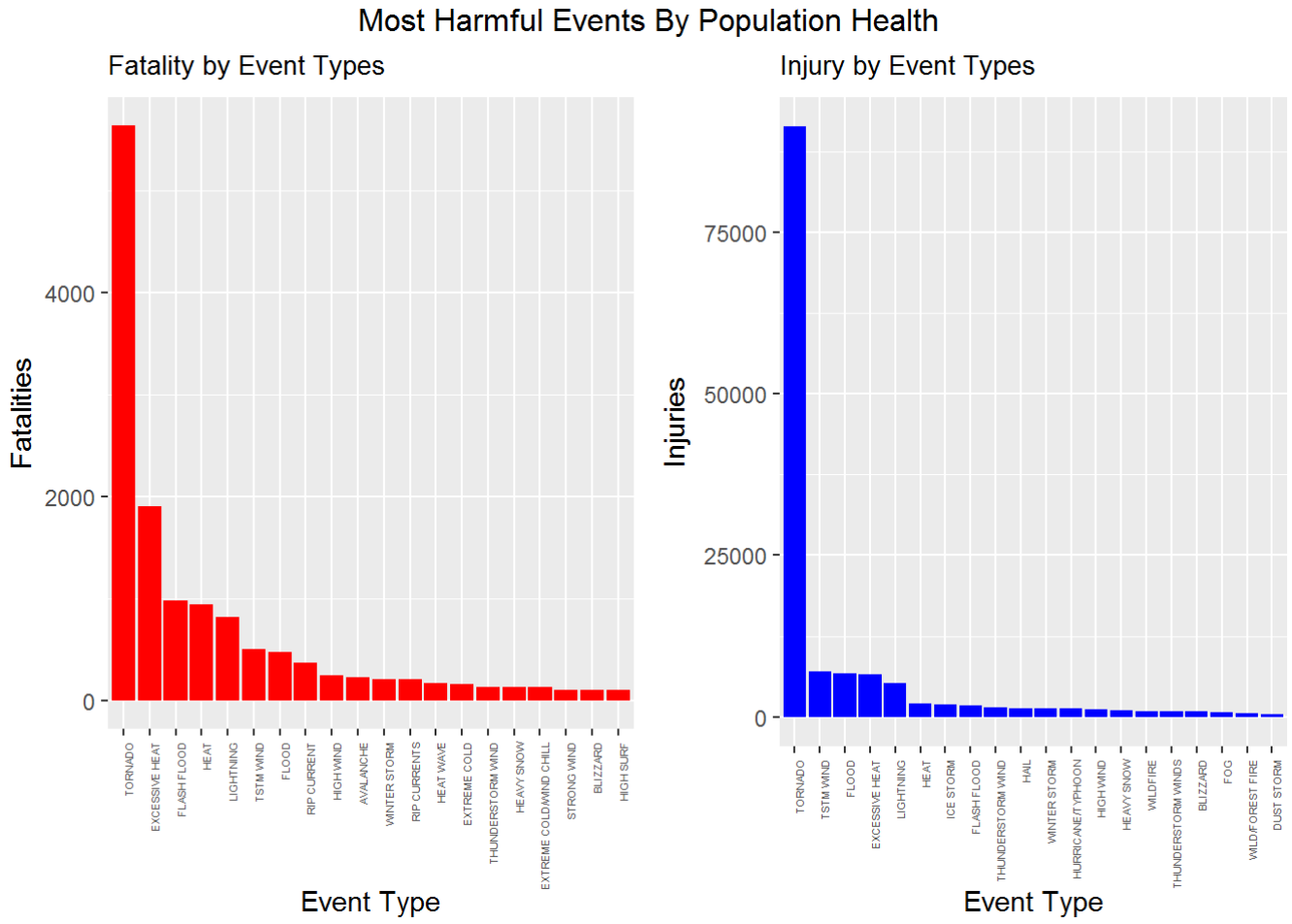
```
fatalityPlot = ggplot(fatalities, aes(x = EVTYPE, y = FATALITIES, theme_set(theme_bw()))) +
  geom_bar(stat = "identity", fill = "red") +
  theme(axis.text.x = element_text(angle = 90, hjust = 1, size = 4)) +
  xlab("Event Type") +
  ylab("Fatalities") +
  ggtitle("Fatality by Event Types") +
  theme(plot.title = element_text(size = 10))
```

Set the injury plot pramaters

```
injuryPlot = ggplot(injuries, aes(x = EVTYPE, y = INJURIES, theme_set(theme_bw()))) +
  geom_bar(stat = "identity", fill = "blue") +
  theme(axis.text.x = element_text(angle = 90, hjust = 1, size = 4)) +
  xlab("Event Type") +
  ylab("Injuries") +
  ggtitle("Injury by Event Types") +
  theme(plot.title = element_text(size = 10))
```

Plot both the fatality and the injury data side by side

```
grid.arrange(fatalityPlot, injuryPlot, ncol = 2, top = "Most Harmful Events By Population Healt
h")
```



Organize and aggragate the data and group to Event Type and store in object “damage”

```
damage <- aggregate(PROPDMGDOLLARS + CROPDMGDOLLARS ~ EVTYPE, data=cleanStormData, sum)
names(damage) = c("EVENT_TYPE", "TOTAL_DAMAGE")
```

Get the most damage event in the US

```
damage <- damage[order(-damage$TOTAL_DAMAGE), ][1:20, ]
damage$EVENT_TYPE <- factor(damage$EVENT_TYPE, levels = damage$EVENT_TYPE)
```

Get the header of the most damage event

```
head(damage)
```

```
##            EVENT_TYPE TOTAL_DAMAGE
## 170             FLOOD 150319678250
## 411 HURRICANE/TYPHOON  71913712800
## 834           TORNADO  57340613590
## 670       STORM SURGE  43323541000
## 244              HAIL  18752904670
## 153       FLASH FLOOD  17562128610
```

Plot the most damage event in the US

```
ggplot(damage, aes(x = EVENT_TYPE, y = TOTAL_DAMAGE, theme_set(theme_bw()))) +
  geom_bar(stat = "identity", fill = "blue") +
  theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
  xlab("Event Type") +
  ylab("Total Damage in US Dollor") +
  ggtitle("the US greatest economic consequences in Property & Crop Damage by top 20 Weather Eve
nts")
```